REMARKS

Claims 13, 16, 21, 24, 28, 31, and 44 have been amended. Claims 16, 24, 31, 46-55 have been canceled. Claims 56-58 have been added. Claims 13-14, 17-22, 25-29, 32-45, and 56-58 are now pending. Applicants reserve the right to pursue the original claims and other claims in this and other applications. Applicants respectfully request reconsideration of the above-referenced application in light of the amendments and following remarks.

At the outset, Applicants acknowledge with appreciation that claims 16, 24, and 31 are in condition for allowance, if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Allowable dependent claim 16 has been rewritten as new independent claim 56. Allowable dependent claim 24 has been rewritten as new independent claim 57. Allowable dependent claim 31 has been rewritten as new independent claim 58. As a result, claims 16, 24, and 31 have been canceled.

Claims 13-14, 17, 19, and 44-45 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,981,398 ("Tsai") in view of U.S. Patent No. 5,534,462 ("Fiordalice"), U.S. Patent No. 5,733,712 ("Tanaka"), and U.S. Patent No. 4,722,913 ("Miller"). The rejection is respectfully traversed.

Independent claims 13 and 44 have been amended to recite, *inter alia*, that an anti-reflective coating layer is *formed on* an oxide layer. The cited references do not disclose or suggest this amended feature. For example, Tsai discloses that target layer 12 is formed on substrate 10 (FIG. 1). An optional blanket silicon oxide layer 13 is formed on layer 12 which arguably corresponds to Applicants' claimed anti-reflective coating layer (Col. 6, ll. 30-44 and FIG. 1). A blanket hard mask layer 14 is then formed on layer 13 (FIG. 1).

In Tsai, the optional blanket target layer 12 "is formed of a material which is susceptible to etching within a chlorine containing plasma . . . [and] [m]aterials which are susceptible to etching within such chlorine containing plasmas include but are not limited to certain metals, metal alloys and metal silicides, as well as polysilicon and several polycides (polysilicon/metal silicide stacks)." (Col. 6, ll. 8-17).

Consequently, Tsai's optional blanket target layer 12 "may be formed of any of the foregoing materials." (Col. 6, ll. 17-18). Tsai does *not* disclose or suggest that the optional blanket target layer 12 is an oxide layer. Thus, Tsai's optional blanket silicon oxide layer 13, which arguably corresponds to Applicants' claimed anti-reflective coating layer, is formed *not* on an oxide layer but on a polycide or metal layer.

Fiordalice is relied upon for disclosing BPSG, PSG, TEOS, and SOG as conventionally used interlayer dielectric materials (Office Action, pg. 4), and adds nothing to rectify the associated deficiencies of Tsai. Tanaka is relied upon for disclosing that SOG and PSG layers are transparent to light having a wavelength of 248 and 365 nm (Office Action, pg. 4), and adds nothing to rectify the associated deficiencies of Tsai and Fiordalice. Miller is relied upon for disclosing that it is conventional in the art to provide an insulating layer over a semiconductor substrate (Office Action, pg. 4), and adds nothing to rectify the deficiencies associated with Tsai, Fiordalice, and Tanaka.

The references fail to disclose or suggest a semiconductor device comprising, *inter alia*, "a substrate; an oxide layer . . . a layer that is transparent to light formed over said substrate and having a first thickness . . . and a first anti-reflective coating formed beneath the transparent layer and *on said oxide layer* and having a second thickness, wherein said first thickness is greater than the second thickness," as recited in claim 13 (emphasis added).

Similarly, the cited references fail to teach or suggest a semiconductor comprising, *inter alia,* "a silicon oxide layer . . . an anti-reflective coating layer formed *on said silicon oxide layer*; and a layer which is transparent to the wavelength of light," as recited in claim 44 (emphasis added).

At best, the cited references disclose a structure in which Tsai's blanket target layer 12 would be formed *on* an oxide layer rather than Tsai's silicon oxide layer 13. Tsai specifically teaches that the silicon oxide layer 13, which arguably corresponds to Applicant's claimed anti-reflective coating layer, is formed *on* the blanket target layer 12. Applicants further submit that there is no motivation to combine the cited references.

Tsai relates to a "method of forming a chlorine containing plasma etched patterned layer." (Abstract). To this end, Tsai discloses that "the blanket hard mask layer 14 is formed from a material selected from the group consisting of silsesquioxane spin-on-glass (SOG) materials and amorphous carbon materials." (Col. 6, ll. 45-49). Employing a hard mask layer 14 consisting of these materials "provides advantages in comparison with a patterned hard mask layer formed employing a silicon oxide material as is otherwise conventionally employed when forming hard mask layers." (Col. 7, ll. 30-37).

Fiordalice relates to forming "conductive plugs in a semiconductor device without the use of common titanium and titanium nitride glue layers which line the plug opening." (Col. 2, ll. 66-67; Col. 3, ll. 1-2). Tanaka relates to forming "a resist pattern including an anti-reflective film." (Col. 3, ll. 20-30). Miller relates to forming "doped semiconductor vias to contacts." (Abstract). The only thing in common between these references is the respective substrates on which their structures are formed. Each reference is directed to solving a different problem.

This fact is underscored since Tsai teaches *away* from using other materials such as BPSG, PSG, or TEOS for hard mask layer 14 as the Office Action asserts would be obvious in view of Fiordalice. The Office Action asserts that Tsai's SOG layer 14 corresponds to Applicant's claimed transparent layer. Applicant's claimed transparent layer is selected from the group consisting of BPSG, PSG, and TEOS as recited in claim 13.

The Office Action relies upon Fiordalice for disclosing BPSG, PSG, and TEOS, and summarily concludes that it would have been obvious to substitute Tsai's SOG material for BPSG, PSG, and TEOS, since these materials are common interlayer dielectric materials. Applicants respectfully disagree. Tsai discloses that *only* SOG or an amorphous carbon material should be used for hard mask layer 14.

Tsai discloses that the hard mask layer 14 "is formed from a material selected from the group *consisting of* silsesquioxane spin-on-glass (SOG) materials and amorphous carbon materials." (Col. 6, lines 45-49) (emphasis added). Tsai teaches that "[a]s is understood by a person skilled in the art, a patterned hard mask layer formed from the blanket hard mask layer 14 of the present invention when formed employing either a silsequioxane spin-on-glass (SOG) material or an amorphous carbon material *provides advantages* in comparison with a patterned hard mask layer formed employing a silicon oxide material as is otherwise conventionally employed . . . [since they are] inherently less susceptible to reduction with reducing agents." (Col. 7, ll. 27-65).

As a result, one skilled in the art would not substitute Tsai's SOG or amorphous carbon material layer 14 for Fiordalice's dielectric materials, *i.e.*, BPSG, PSG, and TEOS, when Tsai specifically discloses the benefits of using SOG and amorphous carbon materials (Col. 7, ll. 27-65).

Claims 14-15, 17, 19, and 45 depend from claim 13 and should be similarly allowable for at least the reasons provided above with regard to claim 13, and on their own merits.

Claims 21-22, 26, 28-29, 36, and 44-45 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Tsai in view of Fiordalice, Tanaka and Miller, and further in view of Applicants' Own Admission in the Present Specification. The rejection is respectfully traversed.

For similar reasons provided above, the cited references do not disclose or suggest an anti-reflective coating layer formed *on* an oxide layer, much less a layer that is transparent to light formed over a substrate which includes a material selected from the group consisting of BPSG, PSG, and TEOS. Tsai discloses that blanket silicon oxide layer 13 is formed *on* blanket target layer 12, and that blanket target layer 12 is a metal, metal alloy, or polycide layer. Tsai does *not* disclose or suggest that blanket target layer 12 is an oxide layer.

Moreover, there is no motivation to combine Tsai and Fiordalice since Tsai discloses that the hard mask layer 14 is formed from a material *consisting of* silsesquioxane spin-on-glass (SOG) materials and amorphous carbon materials.

As such, Tsai, Fiordalice, Tanaka, and Miller do not disclose or suggest a semiconductor device comprising, *inter alia*, "a substrate; an oxide layer . . . a layer that is transparent to light formed over said substrate and having a wavelength of approximately 365 nm . . . and a first anti-reflective coating layer formed beneath the transparent layer and *on* said oxide layer," as recited in claim 21 (emphasis added), or a semiconductor device comprising, *inter alia*, "a substrate; an oxide layer . . . a layer that is transparent to light formed over said substrate and having a wavelength of

approximately 193 nm . . . and a first anti-reflective coating layer formed beneath the transparent layer and *on* said oxide layer," as recited in claim 28 (emphasis added).

Similarly, the cited references fail to teach or suggest a semiconductor comprising, *inter alia*, "a silicon oxide layer . . . an anti-reflective coating layer formed *on* said silicon oxide layer; and a layer which is transparent to the wavelength of light," as recited in claim 44 (emphasis added).

Applicants' own admission is relied upon for disclosing DUV (248 nm), mid-UV (365 nm), and extreme UV (193 nm), and adds nothing to rectify the deficiencies of Tsai, Fiordalice, Tanaka and Miller.

The Office Action asserts that it would have been obvious to expose the photoresist of Tsai to light at a wavelength of 193 nm or 365 nm. Applicants respectfully disagree. Tsai discloses that "the series of patterned photoresist layers 16a, 16b, and 16c is preferably formed employing a deep ultraviolet (DUV) photoexposable photoresist material to form the series patterned photoresist layers 16a, 16b, and 16c *having a minimum linewidth W1 and/or a minimum aperture width W2 of from about .25 to about 1.0 microns*." (Col. 8, lines 9-18) (emphasis added).

In other words, a specific photoexposure apparatus, *i.e.*, a DUV-emitting apparatus, is used in Tsai to develop the patterned photoresist layers 16a, 16b, and 16c. This in turn, allows the photoresist layers 16a, 16b, and 16c to have the required minimum linewidth W1 and aperture width W2 of from about .25 to about 1.0 microns. There is no motivation to employ another light emitting apparatus since this would change the linewidths W1 and aperture width W2 of photoresist layers 16a, 16b, and 16c.

Claims 22 and 26 depend from claim 21 and should be similarly allowable for at least the reasons provided above with regard to claim 21, and on their own merits. Claim 29 depends from claim 28 and should be similarly allowable for at least the reasons provided above with regard to claim 28, and on its own merits. Claims 36 and 45 depend from claim 13, and should be similarly allowable for at least the reasons provided above with regard to claim 13, and on their own merits.

Claims 18, 20, 25, 27, 32, 34-35, and 37-45 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Tsai in view of Fiordalice, Tanaka, Miller and Applicants' Own Admission, and further in view of U.S. Patent No. 5,741,626 ("Jain"). The rejection is respectfully traversed.

Claims 18, 20, 35, 37, and 45 depend from claim 13 and should be similarly allowable for at least the reasons provided above with regard to claim 13, and on their own merits. Claims 25, 27, and 38-40 depend from claim 21 and should be similarly allowable for at least the reasons provided above with regard to claim 21, and on their own merits. Claim 32, 34, and 41-43 depends from claim 28 and should be similarly allowable for at least the reasons provided above with regard to claim 28, and on their own merits.

Specifically, Tsai, Fiordalice, Tanaka, Miller, and Applicants' Own Admission, do not disclose or suggest an anti-reflective coating layer formed *on* an oxide layer, much less a layer that is transparent to light formed over a substrate which includes a material selected from the group consisting of BPSG, PSG, and TEOS. Further, there is no motivation to combine Tsai and Fiordalice since Tsai discloses that the hard mask layer 14 is formed from a material *consisting of* silsesquioxane spin-on-glass (SOG) materials and amorphous carbon materials. Still further, there is no motivation to

employ another light emitting apparatus in Tsai since this would change Tsai's linewidths W1 and aperture widths W2 of photoresist layers 16a, 16b, and 16c.

Jain is relied upon for disclosing the use of silicon nitride as an ARC and also the use of a second antireflective layer; but, adds nothing to rectify the deficiencies associated with Tsai, Fiordalice, Tanaka, Miller, and Applicants' Own Admission. The Office Action asserts that it would be obvious to use a second anti-reflective layer for its known benefits as a barrier layer. Applicants respectfully disagree.

Jain relates to forming a *dual damascene* structure by using "a dielectric phase tantalum nitride (Ta_3N_5) anti-reflective coating (ARC) layer." (Col. 2, lines 50-53). Tsai, by contrast, relates to a "method of forming a chlorine containing plasma etched patterned layer." (Abstract). Tsai's silicon oxide layer 13 is *not* a Ta_3N_5 nitride layer. In fact, Tsai discloses that silicon oxide layer 13 is *optional.* As result, there is no motivation to use a single ARC layer, much less two ARC layers in Tsai's structure especially when Tsai discloses that an ARC layer can be optional. One skilled in the art would not look to Jain's teaching for a second ARC layer when Tsai's first ARC layer is optional.

In addition, as indicated above, the cited references fail to teach or suggest a semiconductor comprising, *inter alia*, "a silicon oxide layer . . . an anti-reflective coating layer formed *on* said silicon oxide layer; and a layer which is transparent to the wavelength of light," as recited in claim 44 (emphasis added).

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to pass this application to issue.

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Respectfully submitted,

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